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rather a representation of a sensation, but no sensation represents another; a sensation is an immediate experience; (c) a sensation bears the mark of externality, an image lacks it; (d) a sensation cannot be called up at will, while an image is independent of peripheral stimulation and is usually under the control of the will. Hallucinations are made up of sensory elements, while hypnotic hallucinations are made up of images. The muscular and tacto-motor sensations appearing as visual, when an object is seen, are not memory images, they are actual sensations, *secondary* sensations, giving fullness of content to the percept, having visual sensory elements as its nucleus. Pathology confirms this view. In certain mental diseases the patient can perceive but he cannot ideate. In others he can ideate but not perceive. Clinical cases point to the qualitative differences of image and sensation, irrespective of the assumption of localization. There are no memory images in perceptual consciousness although the latter may be closely associated with the ideational processes. Put briefly: "the external excitation acting in a particular sense organ produces its appropriate sensations but the peripheral physiological process diffuses, or rather to say, gets irradiated along other neurons of other sense structures, awakening their appropriate sensations. Such sensations, not being directly, but indirectly peripherally initiated should be regarded as secondary sensations." That secondary sensations are sensory and not ideational is seen from the fact that they can be produced only by a stimulus and by their own specialized peripheral physiological processes. One sensation always calls forth only a particular sensation and no other one, and that of a qualitatively different domain. "The main content of the percept consists of hallucinatory secondary sensations. Percepts and hallucinations are of the same grain. A percept is an hallucination with the primary nuclear sensory elements present; an hallucination is a real percept with the primary sensory elements absent." The dissociation of the secondary sensory elements from the primary elements causes us to regard the former as central phenomena — or as abnormal — but it is only the dissociation which is abnormal. When appearing isolated secondary sensations are the simplest form of hallucinations, which become more and more complex as the secondary elements dissociated from the primary became manifested in complex systems. Secondary sensations though present in every percept rarely appear in isolation. The affinity of secondary sensory elements to run into compounds becoming synthetized with primary elements makes it difficult to observe them except in synæsthesia and in the abnormal states of hallucination. Cases of visual and auditory hallucinations are cited. These are cases of the dissociation of the primary and secondary elements. This dissociation is often so deep and extensive that the synthetized system of secondary elements does not bear the least trace of the qualitative aspect of the primary elements; thus a morbid condition of the pharynx may give rise to an auditory and even to a visual hallucination.

The whole discussion is clear, and while perhaps in some minor points lacking in discrimination, is exceedingly suggestive, and will prove valuable in opening up some new lines of treatment.

E. E. WEAVER.

*Ueberblick über die Geschichte und den gegenwärtigen Stand des psycho-physiologischen Problems der Augenbewegung*, by R. HERBERTZ. Zeits. f. Psy., 1907, Vol. 46, No. 2, pp. 123-141.

This is an eminently successful attempt to present in succinct form the historical development and present status of the problem of eye-movements. The author first points out that the problem is not

merely a psycho-physiological one, but that the theoretical question as to the manner in which the phenomena of the external world become presentations in consciousness also is involved. This opportunity for emphasizing one factor or the other is the reason for the various methods of approach and the different answers given by investigators. Ophthalmologists, attacking the problem from an anatomical-physiological point of view, established such laws as those of Donders and Listing. The search for some general principle led inquiry in a physiological-mechanical direction and to Wundt's principle of simplest innervation. Helmholtz thought that the really deciding factor in the problem is to be looked for in an optical principle and encouraged research which proceeded from the psychological conception involved in Meissner's principle of orientation. Earlier investigators, however, erred in attempting to establish a law or principle of eye-movements, rather than to inquire into their import for visual perception. Only by focusing on this, and by specializing research in connection with reading, has a definite and clear answer become possible. The fact, established by Erdmann and Dodge, that visual recognition takes place exclusively during the pauses of rest, while the eye-movements, properly speaking, are interfixation movements, represents a psycho-physiological solution of the problem. It was reached by ascertaining the time necessary for single ocular movements. Volkmann, Huey, Lamanski, Dodge and Cline experimented with this point in view. Dearborn, however, who perfected the method of photographic registration, was able to show that the average time of a single movement is probably 0.02 sec. or somewhat less. This brief duration, in view of Plateau's results, naturally precludes the possibility of our distinguishing between black letters and white spaces while the eye moves.

Since the question of the function of eye-movements in reading is but a specialization of the more general problem of their function in visual perception throughout, we can almost reverse the commonly accepted theory of the past and now say: Seeing, while the eye moves, is scarcely of importance for visual recognition; whenever we really visually recognize, the eye usually is at rest. (Obviously a guarded statement which implies the belief that the last word in the matter has not as yet been spoken.)

M. W. MEYERHARDT.

*An Experimental Study of Visual Fixation.* PROF. RAYMOND DODGE. Studies from the Psychological Laboratory of Wesleyan University, Vol. I, No. 1. Issued by the Psychological Review, as Monograph Supplement of November, 1907.

Prof. Dodge first observed the movements of the eyes during supposed fixation, with the movements of head and body to which these eye-movements are in part compensatory. The eye-movements, however, are found to be due in part to *irregular* movements of head and body, and are then disturbances of fixation for which there can be no compensation. The pulse and breathing are important factors in producing the fixation movements. Head movements may be demonstrated by watching the reflection of objects from behind as seen through smoked glasses upon cross-section paper. Satisfactory methods of recording the movements have not been worked out. The compensatory eye-movements are united with the movements of head and body "into a thoroughly organized motor system," furnishing a co-ordinating mechanism "capable of explaining the intimate correspondence between tactual and visual space." There are also visual motives for the fixation movements, in retinal fatigue and in the correction of inadequate binocular co-ordination.

Control of fixation movements involves ocular reactions, and these